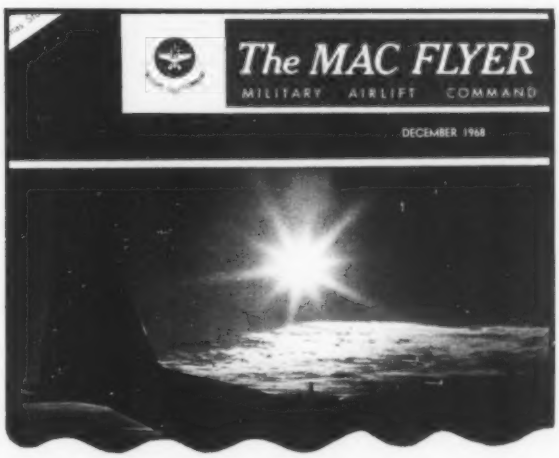
# TMF

June 1990

THE MAC FLYER - For Greater Safety in MAC Air Operations

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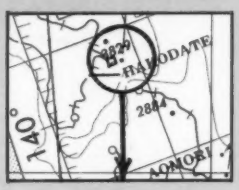


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The evolution of 36 years of *TMF*.

# Christine

## They thought the problem was resolved.

By MSgt. Bruce F. Hanke
163 TFG (Calif. ANG)

"Pull those aileron circuit breakers, NOW!" The aircraft commander fought the wheel and hollered commands at the same time. "Load, check those tabs, I wanna know where they are."

"Tabs deflected less than two degrees," shot back the loadmaster.

"Okay, punch the breakers back in then."

The flight engineer, MSgt. Bill Gant quickly responded to the AC's directions. Maj. Jack Thom, AC, selected full left wing down trim but the airplane continued to roll slowly right, the tabs unable to overcome the aileron surface movement. The ADI showed the Hercules at 50 degrees and rolling. Both pilot and copilot fought the controls hard, attempting to bring the out-of-control C-130 to anything resembling wings level—to no avail. They could not free the disabled machine from her death roll. She seemed bent on doing what she wasn't supposed to or was designed to do, and taking her five-man crew with her. Unrelentingly, she fought the crew as with predetermined purpose.

Suddenly, C-130 #1957 came out of it, snap-rolling rapidly to port. The two pilots overcorrected, then brought her back to wings level. Everyone breathed a heavy sigh of relief.

"I'm going back to check the boost pack," said Gant, heading back to the cargo bay. A few minutes later he returned to the flight deck. "I don't know, everything looks okay. I didn't see anything out of the ordinary. No bent rods, no chafing wires. Nothing. It's probably something in the linkage or maybe a gremlin in the hydraulics. I just don't know for sure."

"Okay, we'll cut this short and get this big hunk of iron back on the ground. Should be down in about 20 minutes." Major Jack Thom was not at all interested in keeping 1957 in the air any longer than absolutely necessary.

Thom put their aircraft back on the ground with no further problems and walked angrily over to the debriefing shack.

Sergeant Gant disembarked the aircraft, cursing the whole time, blaming both maintenance and the aircraft for their wild ride. Navigator Don Navarro tried to calm Gant down, but Gant remained visibly and audibly upset. By the time they reached Operations, Gant had managed to calm down, somewhat.

"Sorry, Major. I guess I got a little too worked up."

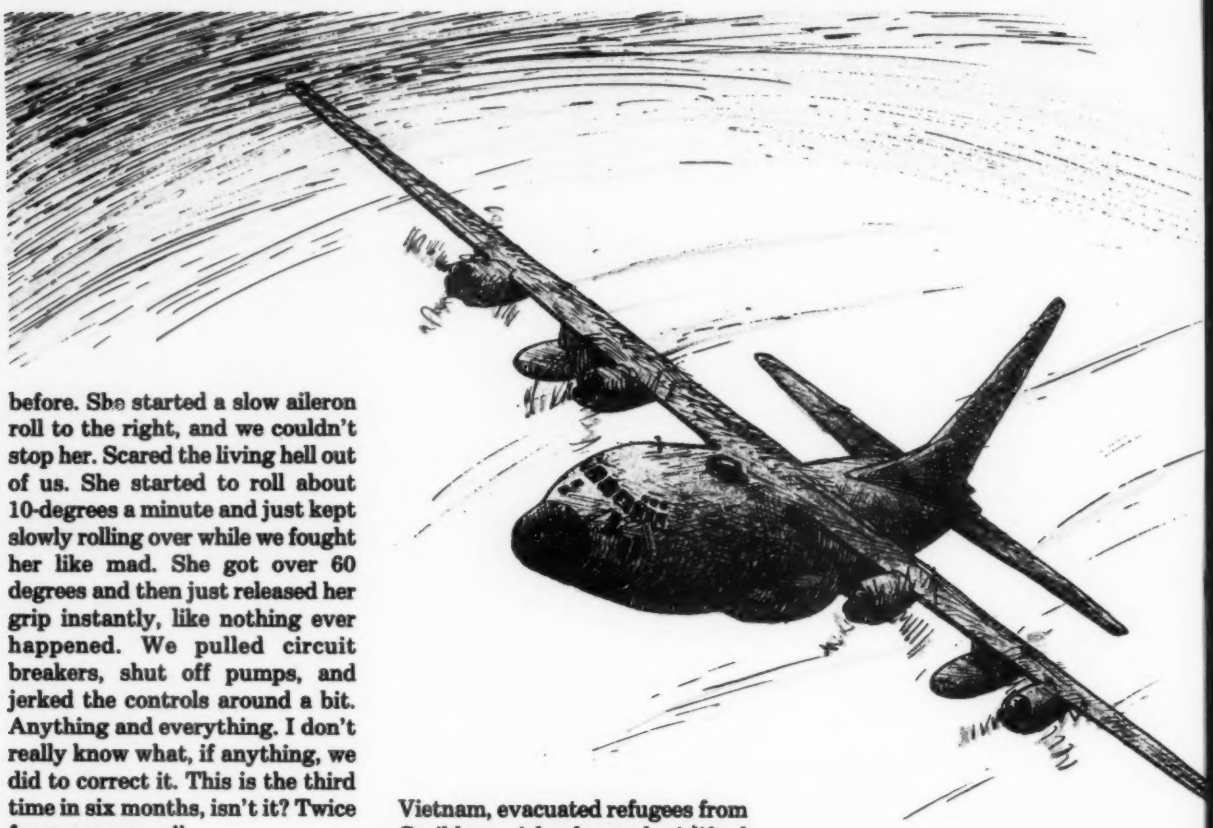
"Yeah, I know. Don't worry about it; it was just one of those things." Not much ever bothered Don Navarro, including the hairy flight they'd just had. He'd grown up on the streets of L.A., and life's little misgivings were not a big deal to him. He took fate as it was dealt. Jack Thom, though, was still steaming.

"Well, Chief, Christine did it again!" Thom threw the 781s on the table in the small debriefing room and sat down with a sigh.

"What happened?" CMSgt. Jim Sellers looked genuinely concerned. Sellers didn't normally cover debriefing, but he'd heard Thom's radio transmissions in maintenance control and decided to cever this one himself. He remembered 1957's problems in from previous incidents.

Thom went on: "Just like

**HONORABLE MENTION**
**1989 MAC FLIGHT SAFETY WRITING CONTEST**



before. She started a slow aileron roll to the right, and we couldn't stop her. Scared the living hell out of us. She started to roll about 10-degrees a minute and just kept slowly rolling over while we fought her like mad. She got over 60 degrees and then just released her grip instantly, like nothing ever happened. We pulled circuit breakers, shut off pumps, and jerked the controls around a bit. Anything and everything. I don't really know what, if anything, we did to correct it. This is the third time in six months, isn't it? Twice for me anyway."

"Yes sir, I believe it is. It will also be the last time she'll fly until we can find something definite. Just put down exactly what happened and we'll red 'X' her until she's fixed."

"Okay." Jack seemed satisfied the Chief and his maintenance troops would take care of it. "I think Marty and the others went to change their shorts," he added laughingly while walking out of the room.

The Chief laughed at the pilot's parting remarks but deep down thought this was not a laughing matter. After all, it could have been a disaster.

C-130 #1957 had been through the mill in her 18 years of existence. She'd seen action in Vietnam, evacuated refugees from Caribbean islands, and airlifted supplies into Africa. During one evac operation in Central America, she'd been shot up badly enough to cause a semi-controlled crash landing from loss of hydraulics and electrical power. That time she'd flown over 300 miles, barely able to stay in the air, until she'd reached a safe airfield. It took eight months of downtime to get her airworthy again. Old 1957 had seen her fair share.

Now it was up to Chief Sellers to see she got the proper attention. The Chief had been around long enough to know this called for more than just the standard approach, so he arranged a meeting the following morning with Thom's crew, Maj. Sam Yount, the flight safety officer, and the three shops involved in the troubleshooting of 1957's flight controls.

"I don't know. I flipped the switch to the disengaged position, but can't really say if she'd actually disengaged." Thom responded to Sergeant Dale's question about whether or not the autopilot aileron channel had been disengaged, but he left too much doubt to satisfy the Automatic Flight Control Systems shop chief.

In fact, the whole meeting hadn't really accomplished much. While everyone thought the problems more than likely lay with the hydraulics, no one could be sure. It was that kind of problem.

"I think the airplane's out to get us," copilot Marty Lerner said to no one in particular.

The safety officer quickly piped up, "Well, Captain, there's

always a simple answer to everything, and this one's no different. Besides, I don't particularly like the thought of you or anyone else thinking the airplane may be jinxed. There's talk going around the squadron, with the name 'Christine' on it. That's not good. We don't need superstition in our business. This isn't a Stephen King novel, and that stuff just doesn't happen. Period. You understand?"

"Yes sir. I wasn't really serious."

"Good."

"It probably *is* something simple." Sergeant Dale directed his statement to the safety officer. "I remember one time we had a problem on an old 'A' model with the autopilot beam guidance coupler for the ILS. Every time you engaged the system in flight, the airplane would track properly left but not right. She'd wander all around. But the system was hardly ever used, so we never accurately diagnosed the problem or accomplished a descent ops check after a maintenance action. It always seemed to check great on the ground. We had problems on and off for three years. We thought we'd fixed it several times. Turns out, the system had never worked properly. All the units possessing the aircraft before us had the same problems. When the system was originally wired into the aircraft, one of the shielded signal cables wasn't properly stripped. The terminal lug had been crimped over the shielding, and the center conductor wasn't touching the terminal, causing a loss of half of the needed signal. After a little detective work, we determined the problem existed for close to 20 years. Twenty years! Seems like something like that couldn't happen, but it did. Anyway, we fixed it and the problem never came back. Once found, it was a simple two-minute fix."

Each of the other shop chiefs related similar stories, and the meeting broke up with a definite resolve to fix 1957 before releasing her for flight again.

Over the following week the airplane was pored over in detail. Numerous minor discrepancies were repaired as discovered, each a potential cause for the strange behavior. On the eighth day after his troops first started work, Chief Sellers was satisfied his troops had done all they could. Two days of nothing but extensive system operational checks followed the actual maintenance, and 1957's hydraulics, electrics, and automatic flight controls ground operated flawlessly over and over. It was time for the acid test.

The aircraft was finally released for flight, and Major Thom's crew was selected to take her up again. The airplane performed perfectly and her crew was satisfied she'd been cured. She flew for a month afterward without any problems.

On the afternoon of July 29th, at precisely 1400, C-130E #1957 took off for a two-day cross country. Jack Thom and his crew were to pick up paratroops at Fort Bragg, deliver them to Biggs in El Paso, and return home. The flight to Bragg would take three hours and 10 minutes.

An hour and 40 minutes into the flight, the airplane began a barely perceptible aileron roll to the right. The copilot noticed what was happening as she reached the 10-degree right wing down mark.

"Jack, she's doing it again!"

"Oh, hell, not now. Pleeeeeeze," pleaded Jack, unhappily.

"Dammit Christine, cut the crap!" Bill Gant wasn't too happy either.

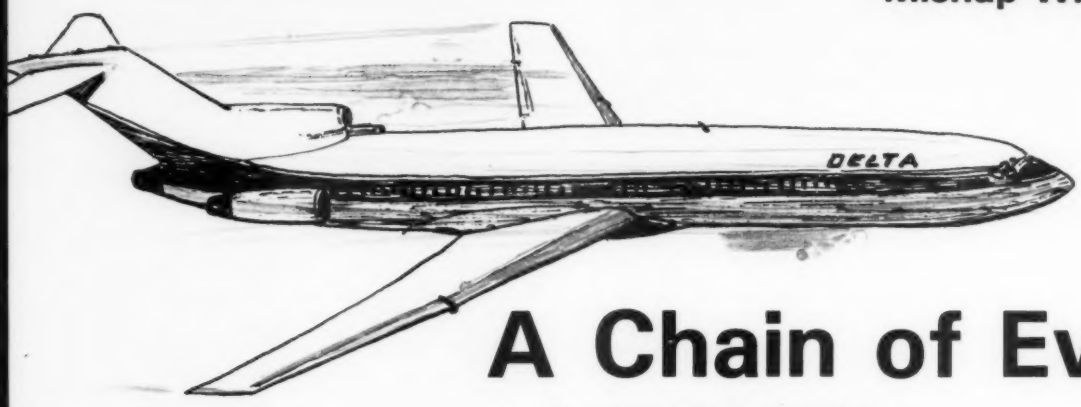
"We don't need to hear that 'Christine crap' right now, Gant, so please keep it to yourself. We have enough to do." Thom disconnected the autopilot and manually attempted to override the slow roll. Again, nothing seemed to work as the airplane seemed bent on rolling over.

"Well, I guess they didn't fix her after all, did they?" Don Navarro secured his maps and equipment and then pushed himself back into his seat to await the inevitable.

Major Jack Thom swore silently as he and Marty Lerner fought the wheel like there was no tomorrow.

Bill Gant thought he heard the echo of soft laughter as the airplane rolled completely over and nosed herself down toward the trees below.

MSgt. Bruce F. Hanke, a repeat winner, joined the Air Force in 1967, serving tours at Tuy Hoa AB, Vietnam; Clark AB, Phillippines; and McGuire AFB, N.J. He left active duty for the Reserves in 1972 at Westover AFB, Mass. From 1973 to 1985 he was part of the Rhode Island ANG. In 1985 he went west and joined the California ANG. Presently he is Chief of the Photo Sensors Shop working on F-4E aircraft.




# A Chain of Events

## Human factors revisited

At 0:01, Central Daylight Time, 31 August 1988, Delta Air Lines Flight 1141 crashed shortly after liftoff from Dallas-Fort Worth International Airport (DFW). The flight crew reported takeoff roll appeared to be normal with no warning lights, audible warnings, or unusual instrument conditions. Of the 108 persons on board, 12 passengers and two crewmembers were killed, 21 passengers and five crewmembers seriously injured, and some of the remaining 68 passengers received minor injuries.

### FLIGHT HISTORY

Flight 1141, a Boeing 727-232, was a regularly scheduled passenger flight from Jackson, Miss., to Salt Lake City, Utah, with an intermediate stop at DFW. The flight departed Jackson for DFW at 0630 Eastern Daylight Time. The only logbook discrepancy was an inoperative Number 1 main fuel tank quantity gauge. The First Officer flew the leg to DFW and noted nothing out of the ordinary; landing and taxi were uneventful. Operation of the airplane with the fuel quantity gauge inoperative was permitted by Delta.

The pushback at DFW occurred at 0830, as scheduled. All three engines were started initially, but when it became apparent there would be a delay before departure, the Captain decided to shut down the Number 3 engine to conserve fuel. When the airplane became fourth in line for departure, the Second Officer directed the flight attendants to prepare the cabin for departure. The Captain then ordered Number 3 engine restarted. At 0858:38, the local controller instructed, "Delta eleven forty-one, taxi into position runway one eight left and hold. . . ."

With this clearance, Flight 1141 was, in effect, directed to pass the airplanes ahead of it on the taxiway and take the Number 1 position. At 0859:17, the local controller instructed, "Delta eleven forty-one, fly heading one eight five. Runway one eight left, cleared for takeoff." The First Officer acknowledged both transmissions.

After the mishap, the Second Officer stated that immediately after liftoff, the right wing dropped and he heard the comment "engine failure" made by either the Captain or First Officer. The Captain stated, after the accident, that "all was normal . . . everything was routine" up to rotation. Rotation was initially normal, but as the main gear wheels left the ground, he heard "two explosions." He said it felt as "though the airplane was experiencing reverse thrust." He also stated the airplane began to "roll violently . . . it was all I could do to control the airplane."

The airplane struck the ILS localizer antenna about 1,000 feet beyond the end of Runway 18L, came to rest approximately 3,200 feet beyond the departure end of the runway, and was destroyed by impact forces and postcrash fire. The flight lasted approximately 22 seconds from liftoff to first ground impact.

Witnesses in the control tower and on the ground agreed that Flight 1141's takeoff roll appeared normal until shortly after rotation. They stated the airplane rotated to a higher than normal pitch angle, and flames or sparks were emanating from the rear of the airplane. They said as the airplane continued down the runway, the wings rocked from side to side and the airplane appeared to be out of control. Witnesses lost sight of the airplane after it struck the ground and disappeared into a cloud of dust.

None of the ground witnesses could recall the position of the flaps during the takeoff roll or prior to impact.

## ANALYSIS

Examination of the flightcrew's personal background and actions during the two to three days before the mishap flight revealed nothing remarkable.

### LIFT DEVICES

The Boeing 727-232 lift devices consist of three leading edge flaps (Krueger flaps) located on the inboard lower surface of each wing, four leading edge slats on the outboard portion of the wing, and inboard and outboard trailing edge flaps. Flap settings are controlled from the cockpit by moving the flap lever through a detented arc on the right side of the center control stand. Alternate provisions for flap extension are incorporated in the system in the event of normal system failure. Two identical electrically operated protection systems are provided to prevent asymmetrical operation of the trailing edge flaps.

The flap control mechanism in the cockpit area was found in the "flap up" position. The mechanism was intact and functional. The area of the left wheel well containing the inboard flap control valve was burned and the follow-up mechanism, from the inboard flap power drive unit to the inboard flap control valve, had been consumed by fire. The control rod attached to the inboard flap control valve was in a "flap up" position. The left wing's inboard flap was attached to the wing and in the retracted position.

Based on the physical evidence and its analysis of the position of the trailing edge flap drive mechanism, the outboard aileron lockout mechanism and the leading edge flap and slat actuators, the Safety Board concluded the cockpit flap control lever was in the 0-degree detent and the trailing edge flaps, leading edge flaps, and slats were fully retracted before impact.

### TAKEOFF WARNING SYSTEM

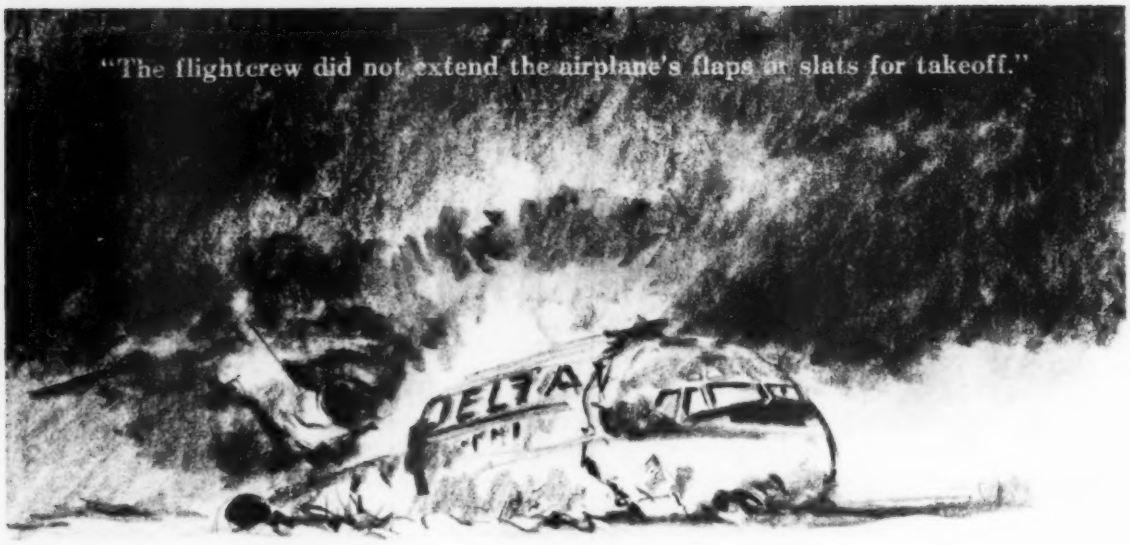
The Boeing 727-232 is equipped with a takeoff warning system to alert the crew when the aircraft is improperly configured for takeoff. The warning system is activated when thrust lever Number 3 is advanced beyond a predetermined position. The takeoff warning horn will sound when one or more of the following conditions exist: (1) the stabilizer trim is outside the takeoff range; (2) outboard trailing edge flaps are less than 5-degrees; (3) Numbers 4 and 5 leading edge slats are not extended or, (4) the speedbrake handle is not in the "down detent" position.

The Number 3 autothrottle clutch pack assembly containing the takeoff warning system throttle switch was removed from under the cockpit. It exhibited some impact damage. Continuity tests were conducted on the switch. There was not continuity between the common and normally open terminals of the switch during the first two finger activations. The switch exhibited a blue-green corrosion-type substance around the normally open terminals. The switch was tested for continuity and resistance while installed in the Number 3 autothrottle clutch pack assembly. Upon activation, the normally open switch moved to the closed position.

Had the takeoff warning horn sounded when the Captain advanced the thrust levers for takeoff, the sound would have been clearly evident on the CVR. The lack of the alarm leads to two possible conclusions: (1) only the outboard trailing edge flaps and the leading edge flaps and slats were properly set for takeoff and subsequently were retracted at or before liftoff or, (2) the takeoff warning system malfunctioned.

The findings that the switch did not electrically close during the first two attempts at the accident site; that successful activations of the switch during the teardown investigation was "hit-or-miss" due to the positioning of the actuator button to the switch plunger; and that the internal contacts of the switch showed contamination, support a conclusion the takeoff warning system did not arm when Number 3 engine thrust lever was advanced for takeoff.

As a result of the Northwest Airlines DC-9-82 takeoff mishap at Detroit, Mich. in August 1987, the FAA issued an Air Carrier Operations Bulletin. This bulletin specified action to be taken by principal inspectors to review overall takeoff warning system performance; i.e., test the systems, ensure that each carrier's procedures are consistent with airplane manufacturers' current recommendations, and ensure that checklists appropriately support required crew actions for each of their assigned carriers. The FAA's inspection of the Boeing 727 takeoff warning systems found 35 anomalies in the 1,190 airplanes surveyed. Twelve of the functional problems found were attributed to the throttle lever switch. The FAA team's opinion was that this condition, if not corrected, could result in an attempted takeoff when the airplane was not in the proper takeoff




configuration. The FAA team recommended the Boeing 727 takeoff warning system be changed from a throttle activated system to an engine pressure ratio (EPR) activated system (the subject of a Boeing service bulletin in 1979.) Delta's B-727 fleet contained airplanes with a takeoff warning system activated by the throttle switch and others activated by EPR. This mixed fleet resulted from the acquisition of B-727s through Delta's merger with Western Airlines. Delta evaluated the service bulletin and determined the modification was not needed for its operation. Therefore, many Delta B-727s retained the throttle activated systems.

FLIGHT STANDARDS

As a result of an FAA National Inspection Team Report on the safety audit of Delta conducted in July 1987, Delta created the position of System Manager, Flight Standards. This position oversees the line check airman program and places them under centralized control. Fleet managers are responsible for the technical support to the pilots for operation of their particular airplane type. They have, in part, responsibility for airplane manuals, checklists, and document revisions. The investigation revealed that Delta did not insist on a standardized approach towards cockpit management. Testimony from management and training personnel indicated Captains were allowed wide latitude in their conduct of cockpit operations.

The Safety Board sought to determine the relationship between crew performance and events in this mishap. The CVR transcript shows the conversation in the cockpit was carried almost exclusively by the First Officer with an occasional comment from the Captain. The First Officer acted as the social element in the cockpit. The Captain is responsible for the logical and timely completion of cockpit duties by crewmembers. It's his responsibility to maintain the necessary discipline in the cockpit so that company procedures are carried out properly. The Captain did not stop the First Officer's interruptions of cockpit duties when he initiated nonrelevant conversation, or made comments about his observations outside the cockpit while the airplane was being pushed back, while the engine start checklist was run, when the airplane was taxied from the push-back position and during the subsequent 25 minutes taxi time before takeoff clearance was received. Immediately after completing the taxi checklist, the First Officer began lengthy conversations with a Flight Attendant. The Safety Board believes that had the Captain exercised his responsibility and asked the Flight Attendant to leave the cockpit or, as a minimum, stopped the nonpertinent conversations, the 25-minute taxi time could have been utilized more constructively and the flap position discrepancy might have been discovered.

Delta's management had initiated training and other policy changes after the series of mishaps experienced in 1987. The Safety Board realized it takes time to bring about fundamental and far reaching changes in an organization as large as Delta Air Lines. Furthermore, Delta was in a period of rapid growth and had recently merged with another airline with attendant problems of cultural differences,

management integration, and a host of personnel problems, to name only a few. While the Safety Board viewed these problems sympathetically, it believed management could have been more attentive to the obvious shortcomings in its safety posture and more aggressive in implementing changes in its training and crew checking programs and guidance provided its crewmembers. In light of this discussion, the Safety Board found the slow implementation of procedural modifications was a contributing factor in this mishap.

## CHECKLIST PROCEDURES

Delta's expanded checklists are contained in the Normal Procedures section of the Boeing 727 Pilot Operating Manual. The checklist contains Captain, First Officer, and Second Officer actions in which a "challenge and response" format is used. The Captain is required to verbally initiate the checklist procedure. The Second Officer reads aloud the challenge, and the appropriate crewmember makes the proper response. According to Delta training personnel and other Delta flightcrews, Delta's procedure prior to March 1988 had been to extend flaps only after all three engines had been started. This procedure was changed in March 1988 to allow flap extension anytime after departing the ramp area. The procedure did not require the First Officer announce his actions of setting the flaps. The board concluded that the action of setting the wing flaps to the 15-degree detent could not be verified from CVR examination.

The Pilot Operating Manual notes that prior to takeoff, a briefing is to be made in minimum but adequate detail outlining the plan of action for takeoff. However, it also states that this briefing may be given as part of the BEFORE START CHECK. The "before takeoff briefing" was not heard on the CVR of Flight 1141.

Delta's sterile cockpit procedure corresponds to FAR Part 121.542, which prohibits cockpit activities not related to safe operation of the airplane during critical phases of flight. Critical phases of flight are identified in the FAR as: all ground operations involving taxi, takeoff, landing, and all other flight operations below 10,000 feet, except cruise flight.

A NASA research psychologist testified it was rare to see a checklist ignored completely or not done, but this had occurred from time to time during various phases of flight in the simulator. There was a lot of variation with regard to checklist usage, from the conduct described in this incident to a "very clearly read challenge/response methodology."

As a result of the takeoff delay and in accordance with Delta's procedures, the flightcrew shut down Number 3 engine and withheld accomplishment of part of the TAXI and BEFORE TAKEOFF checklist items until after Number 3 engine was restarted. The flightcrew began to restart the engine when they believed they were fourth in line for takeoff. The CVR shows a distinct difference in the crew's conduct in the accomplishment of the checklists when they were cleared into position to hold for takeoff. Apparently, the Second and First Officers recognized the need for expeditious completion of the remaining checklist to prevent delay on the runway. Thus, where the checklists previously had been accomplished in an orderly/measured manner, the tone and behavior of the crewmembers clearly became rushed. All three members of the cockpit flightcrew testified that, by habit, they would have verified the trailing edge flap indicators and leading edge flap and slat light indicators during the checklist completion; however, none specifically recalled having done so on the accident flight.

## PROBABLE CAUSE

The National Transportation Safety Board determined the probable cause of this mishap to be: (1) the Captain and First Officer's inadequate cockpit discipline which resulted in the flightcrew's attempt to takeoff without the wing flaps and slats properly configured and, (2) failure of the takeoff configuration warning system to alert the crew that the airplane was not properly configured for the takeoff.

Contributing to the mishap was Delta's slow implementation of necessary modifications to its operating procedures, manuals, checklists, training, and crew checking programs which were necessitated by significant changes in the airline following rapid growth and merger.

Also contributing to the mishap was the lack of sufficiently aggressive action by the FAA to have known deficiencies corrected by Delta and the lack of sufficient accountability within the FAA's air carrier inspection process.

## APPLICATION TO MAC

The application to MAC drawn from this mishap could fill volumes. The same words keep popping up time and time again in our own mishap investigations: *CREW DISCIPLINE, CHECKLIST DISCIPLINE, COCKPIT MANAGEMENT.* We are fully aware that accidents and incidents are often the result of combinations of factors. When the chain of events progresses beyond a certain point, unbroken, a mishap results. In this case, human factors combined with a failure of a mechanical back-up system caused the mishap.

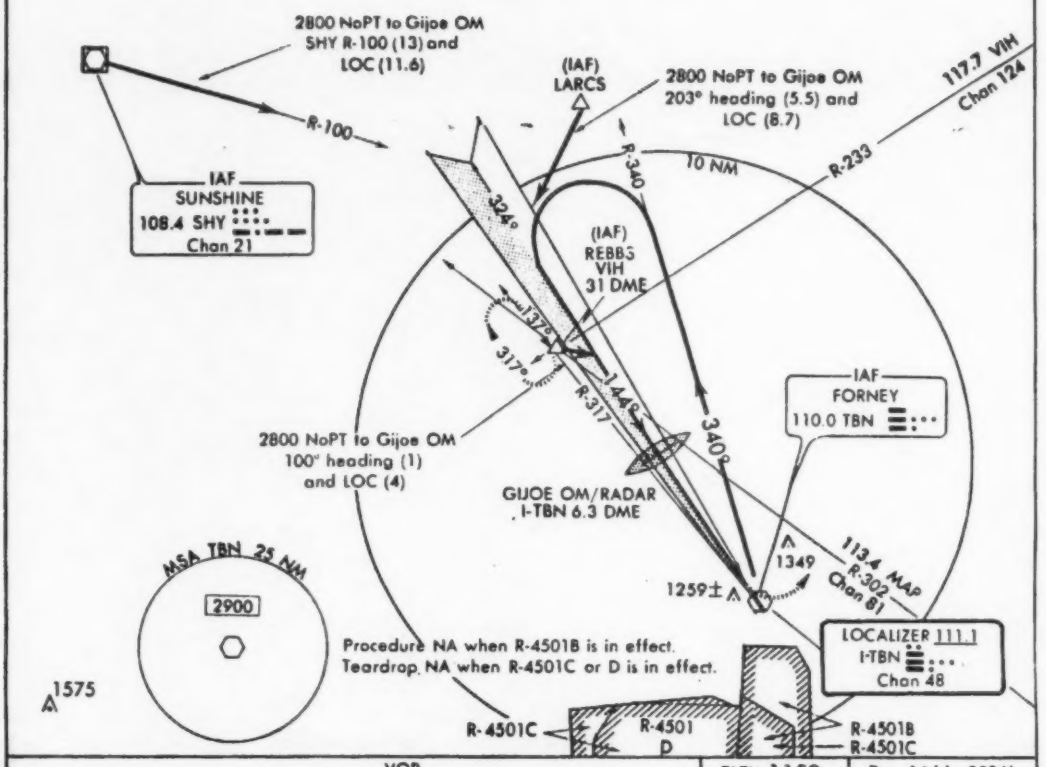
Adapted from *NTSB Report/AAR-89/04*

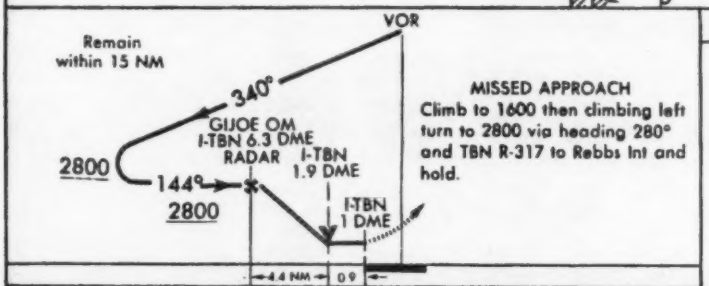
# LOC RWY 14

100
AL-5093 (FAA)

FT. LEONARD WOOD/FORNEY AAF (TBN)
FT. LEONARD WOOD, MISSOURI

FORNEY TOWER* 125.4 (CTAF) 241.0
ASR/PAR
ATIS* 110.0



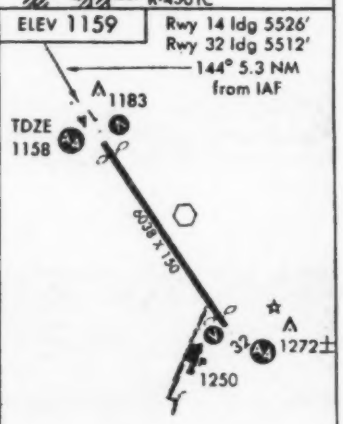




MISSED APPROACH
Climb to 1600 then climbing left turn to 2800 via heading 280° and TBN R-317 to Rebbs Int and hold.

| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| S-14 | 1480-¾ 322(400-¾) | | | 1480-1 322(400-1) |
| CIRCLING | 1580-1 421 (500-1) | 1620-1 461 (500-1) | 1660-1½ 501 (600-1½) | 1720-2 561 (600-2) |

When control zone not in effect, use Springfield altimeter setting and increase all MDAs 280 feet.
ACTIVATE MALS and VASI Rwys 14, 32, HIRL Rwy 14-32-CTAF.

ELEV 1159
Rwy 14 ldg 5526'
Rwy 32 ldg 5512'




HIRL Rwy 14-32
REIL Rwys 14 and 32

FAF to MAP 5.3 NM

| Knots | 60 | 90 | 120 | 150 | 180 |
|---|---|---|---|---|---|
| Min:Sec | 5:18 | 3:32 | 2:39 | 2:07 | 1:46 |

# *TMF* Instrument Quiz

A contingency operation is in progress and the NAF has approved your mission for operations into Forney.

1. This approach when flown from the IAF at Forney (TBN) is a:
   a. Procedure turn.
   b. Holding pattern (in lieu of procedure turn).
   c. Arc and radial.
   d. Procedural track (teardrop).

2. You are approaching TBN VOR and cleared for the approach. Your heading is 270 degrees. You may:
   a. Over the IAF, turn immediately in the shorter direction to intercept the published track.
   b. Use normal lead points to intercept the course, without overfly of the IAF.
   c. Fly over the IAF, then use normal lead points to intercept the course.
   d. Maneuver the aircraft into favorable alignment before starting the approach.

3. You are level at 4,000 feet as you overfly TBN. When can you descend to 2,800 feet?
   a. As soon as you are cleared for the approach.
   b. Start the descent when abeam or past the IAF and on a parallel or intercept heading to the procedural track course.
   c. Start the descent abeam or past the IAF.
   d. Descend from the turn altitude when the aircraft is established on the inbound segment of the procedural track.

4. On any approach, maximum designed obstacle clearance is based on the pilot's attempt to maintain course centerline; the pilot must use position orientation and judgement to determine when to descend while attempting to intercept the procedural track.
   a. True.
   b. False.

5. What is the highest obstacle?
   a. 1,349 feet.
   b. 1,272 feet.
   c. 1,259 feet.
   d. 1,575 feet.

6. The control zone is not in effect and center reads you the altimeter setting for Springfield. What will be the Cat. C MDA for the straight-in approach?
   a. 1,480 feet.
   b. 1,660 feet.
   c. 1,760 feet.
   d. 1,720 feet.

7. Use of the Visual Descent Point (VDP) is a mandatory part of the procedure.
   a. True.
   b. False.

8. At USAF bases where VASI is installed, the VDP and VASI glide paths are normally coincident.
   a. True.
   b. False.

9. When crossing GIJOE outer marker the marker beacon light/indication will:
   a. Illuminate steadily for two seconds.
   b. Flash six dots per second.
   c. Alternate dot and dash.
   d. Flash two dashes per second.

10. This approach has a "remain within" distance of:
   a. 10 nautical miles.
   b. 12 nautical miles.
   c. 15 nautical miles.
   d. 10 DME.

11. The field elevation is 1,159 feet. This is:
    a. The highest point in the first 3,000 feet of Runway 14.
    b. The highest point on any usable landing surface.
    c. The highest point on the ramp.
    d. The average elevation of the runway.

12. What approach lighting is available for Runway 14?
    a. Medium intensity army lighting system.
    b. Medium intensity approach lighting system with sequenced flashers.
    c. Medium intensity approach lighting system.
    d. Medium intensity approach lighting system with runway alignment indicator lights.

13. At an airfield with pilot controlled lighting, keying the mike on the specified frequency seven times in five seconds will activate the available lighting to be the highest intensity available.
    a. True.
    b. False.

14. You are getting ready to depart Forney. Your aircraft is parked in front of the tower which has a sign proclaiming the elevation is 1,159 feet. With the current altimeter setting your altimeter must read between _____ feet and _____ feet, or it is out of tolerance for flight.
    a. 1,235 feet and 1,083 feet.
    b. 1,233 feet and 1,085 feet.
    c. 1,234 feet and 1,084 feet.
    d. 1,250 feet and 1,084 feet.

15. Your aircraft is equiped with dual VOR and dual TACAN receivers, the systems are considered reliable for instrument flight if they check within plus or minus four degrees of each other. Forney has designated a VOR ground check point, the allowable CDI error for checking the VOR is _____ degrees and the CDI and bearing pointer should agree within the tolerances specified for you aircraft.
    a. Plus or minus 3 degrees.
    b. Plus or minus 4 degrees.
    c. Plus or minus 6 degrees.
    d. Plus or minus 5 degrees.

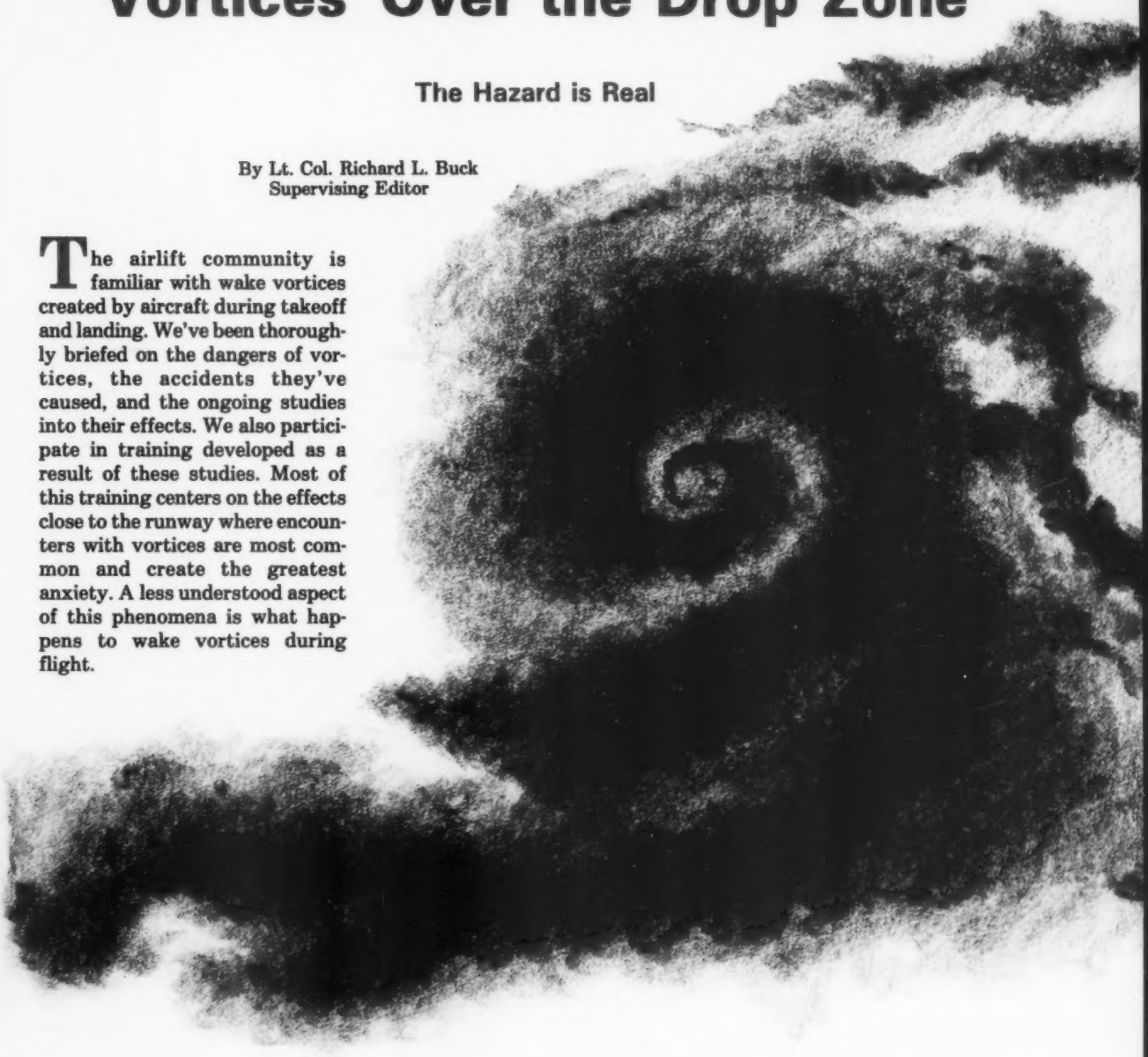
**ANSWERS**

1. d. Procedural track (teardrop). There is no specific depiction for a procedural track. It may employ arcs, radials, courses, turns, etc. When a specific flight path is required, procedural track symbology is used to depict the flight path between the IAF and FAF. (AFM 51-37, para. 14-4a.)
2. a. When over the IAF, turn immediately in the shorter direction to intercept the published track. To use lead points you must be able to determine distance from the navaid used for the approach. Forney VOR has no DME to use for a lead point. (AFM 51-37, para. 12-4b.)
3. b. When a descent is depicted at the IAF, start descent when abeam or past the IAF and on a parallel or intercept heading to the procedural track course. Except for initial descent at an IAF, be established on the appropriate segment of the procedural track before descent to the next altitude shown on the IAP. (AFM 51-37, para. 12-4d(1).)
4. a. True. (AFM 51-37, para. 12-4d(1) Note.)
5. d. 1,575 feet.
6. c. 1,760 feet.
7. b. False. VDPs are not a mandatory part of the procedure, but are intended to provide additional guidance where they are implemented. The VDP is a defined point on the final approach course of a nonprecision straight-in approach procedure from which a normal descent (approximately 3 degrees) from the MDA to the runway touchdown point may be commenced provided visual reference with the runway environment is established. (AFM 51-37, para. 7-6b(6).)
8. a. True. Where VASI is installed, the VDP and VASI glide paths are normally coincident. If VASI isn't installed, the descent is computed from the MDA to the runway threshold. On multifacility approaches, the depicted VDP will be for the lowest MDA published. (AFM 51-37, para. 7-6b(6).)
9. d. Outer marker beacons flash two dashes per second. (AFM 51-37, Fig. 5-4.)
10. c. 15 nautical miles.
11. b. Field elevation is the highest point on any usable landing surface. Touch down zone elevation is the highest point in the first 3,000 feet of the landing runway. (AFM 51-37, para. 7-6b(4)(a).)
12. c. Medium intensity approach lighting system (MALS), is indicated by the circled A4. (Flight Information Handbook, Sec. B.)
13. a. True. (Instrument Approach Procedures book, General Information & Abbreviations.)
14. c. 1,234 feet and 1,084 feet. The maximum allowable error is 75 feet. If altimeter error exceeds 75 feet, the instrument is out of tolerance for flight. (AFM 51-37, para. 7-1a, 8-1g(2).)
15. b. Plus or minus 4 degrees. When checking the VOR/TACAN at a designated ground checkpoint, the allowable CDI error is plus or minus 4 degrees. (AFM 51-37, para. 8-1m(6).)

# Vortices Over the Drop Zone

## The Hazard is Real

By Lt. Col. Richard L. Buck
Supervising Editor



The airlift community is familiar with wake vortices created by aircraft during takeoff and landing. We've been thoroughly briefed on the dangers of vortices, the accidents they've caused, and the ongoing studies into their effects. We also participate in training developed as a result of these studies. Most of this training centers on the effects close to the runway where encounters with vortices are most common and create the greatest anxiety. A less understood aspect of this phenomena is what happens to wake vortices during flight.

Until recently, we haven't had many identifiable problems with wake vortices during formation flights and airdrop operations. This may be because wake vortices are usually invisible, and it's tough to blame short-term wind gusts and turbulence on an unobservable force.

A wingtip vortex is generated by any aircraft that develops lift. The higher pressure under the wing and lower pressure on top of the wing cause a vortex to form at each wingtip. The velocity field produced by a wingtip vortex is proportional to the size and airspeed of the aircraft.

Wingtip vortices, generated by C-5 aircraft or other jumbo jets, have caused smaller aircraft to experience severe wind shear and become uncontrollable. Numerous aircraft accidents have been attributed to this "wake turbulence" caused by wingtip vortices. Military transport aircraft vortices were studied in the past and, to some extent, tested to determine the effects of wingtip vortices.

In 1966, during a test penetration of a C-141A vortex at 38,000 feet and one mile in trail, all four engines on the penetrating C-141A compressor stalled and the Number 4 engine flamed out. In later Federal Aviation Administration (FAA) testing, a single-engine aircraft penetrating the vortex of a C-5 aircraft rotated 360 degrees about the longitudinal axis (barrel rolled) with no control input.

During limited testing of C-141A and C-5A vortices by the FAA in 1970, peak velocities of greater than 65 knots were recorded at the vortex core. The radius of the core varied from two to ten feet. This information was not published because the FAA determined data obtained was insufficient to establish a trend on either aircraft.

Wingtip vortices have also caused problems in airdrop operations. A test conducted by the Air Force Flight Test Center in 1971 found severe oscillations and descent rate increases of 75 percent (15 feet per second) on parachutes airdropped from one to three miles behind a C-5A aircraft. No method of ensuring actual parachute/vortex contact was used and test results were inconclusive.

In 1980, the CLOSE LOOK II project identified a need to conduct airdrops at very low altitude and high airspeed. The U.S. Army Natick Research, Development, and Engineering Center has attempted to develop parachute systems capable of operating at very low altitudes. A HQ MAC weather study in February 1984 provided theoretical calculations showing vortex-induced wind could have an undesirable effect on low altitude airdrop operations. Their report stated: "Paradrop operations using C-141 aircraft below 1,000 feet altitude could experience winds greater than acceptable standards for safe operations (i.e. greater than 13 knots for personnel drops) due solely to wake vortices. For C-130 aircraft, the vortices are not nearly as strong but could be a factor when conducting drops below 600 feet."

In October 1985, HQ MAC Tactics submitted an Operational Test and Evaluation (OT&E) request for C-130 and C-141B aircraft. The test order was completed in January 1986 and, in May 1986, was expanded to obtain C-5 vortex data. In September 1987, the C-5 portion was redesignated a MAC project and expanded to obtain vortex interaction data on parachute systems.

The OT&E of the effects of C-130/C141B wake vortices on the drop zone environment was conducted from January to August 1987, and the final report was published in September 1988. The purpose of the study was to gather empirical data on C-130 and C-141B vortex-induced wind, determine if a hazard to personnel and equipment parachutes exists for airdrop operations at very low altitudes (300-600 feet AGL) and, if necessary, develop a means to counteract or avoid the hazard. Aircraft vortices were measured in personnel, equipment, container delivery system, and high speed airdrop configurations. This was the first test ever conducted to determine the effect aircraft vortices have on personnel and equipment parachute systems. Testing was administered by the USAF Airlift Center (USAFALCENT) and accomplished by the National Oceanic and Atmospheric Administration Air Resources Laboratory (NOAA-ARL) at the U.S. Army Yuma Proving Grounds.

The test was accomplished in three phases. In the first phase, attempts were made to measure vortex parameters in the airdrop configuration. Plans to determine a feasible test method began in March 1986. A C-130 flew past a tower instrumented with conventional propeller-type anemometers. No usable data was captured by the anemometers because the propeller anemometers measured only the horizontal wind component.

A second feasibility test involved flying a C-141B aircraft above a smoke screen to observe the minimum descent altitude of the vortices. This method required

absolute calm wind conditions and was not feasible.

As a result of the failure of these preliminary feasibility tests, a fly-by of a tower instrumented with hot film anemometers was determined to be the best means of obtaining the required information. This specially instrumented tower was capable of measuring vortex-generated wind velocities (both speed and direction) in a three-dimensional plane. Vortex measurement was accomplished near Idaho Falls, Idaho, at a tower owned by NOAA.

In the second phase of the test, the effect of a vortex on a parachute system was determined. Airdropping a parachute into an aircraft-generated vortex was used during C-5A airdrop testing in 1971; however, because the vortex was not visible, the degree of parachute/vortex interaction could not be determined. Therefore, a vortex visualization technique using smoke generators was developed for this test. Self-contained smoke generators were mounted below the wingtips of C-130 and C-141B aircraft for the parachute/vortex interaction portion of the test and removed upon completion. The smoke generators were again mounted on the C-130 and C-141B for the vortex measurement portion.

In the final phase of the test, a vortex/parachute interaction computer model was developed at the USAFALCENT. This model predicted probability of interactions based on inputs of formation airdrop procedures, parachute and vortex parameters, and statistical wind data.

The test concluded that vortices are significant in terms of size, duration, and velocity. Put quite simply, vortices descend behind the aircraft at approximately six feet per second. They spread out to a maximum of 375 feet in width and 240 feet in height. Rotation of the vortices can produce roll rates of up to 10.1 degrees per second. Parachute/vortex interaction can result in potentially hazardous conditions, including collapse or partial deflation of canopies for one to three seconds. This is especially critical at low altitudes. Parachutes entering vortices may not have sufficient vertical fall distance remaining to reinflate after penetrating a vortex. Personnel parachutes need 360 feet of clear air and equipment chutes need 270 feet after stabilizing to prevent possible hard impact. The test also concluded that significant oscillation, loss of planned parachute descent time and altitude, collision or entanglement resulting from changes in parachute descent rate, hard landing, and dragging of loads on the surface could result. Vortices can decrease parachute descent rates by approximately 60 percent or increase the descent rate by up to 140 percent. Indeed, the effects of parachute/vortex interaction are hazardous at very low altitudes. There is almost no probability for hazardous parachute/vortex interaction for formation airdrop operations at current drop altitudes (except C-141B standard visual formations of more than seven aircraft at or below 800 feet AGL and C-141B multi-element formations using Stationkeeping Equipment procedures at or below 900 feet AGL). Finally, the test determined that parachute/vortex interaction can be avoided at low airdrop altitudes by altering airdrop formation geometry.

As a result of the conclusions, USAFALCENT recommended the Air Force: (1) develop and evaluate formation tactics to avoid hazardous vortex interaction; (2) test the effect of C-130, C-141, and C-5 vortices on very low altitude parachute systems when these are developed; (3) disseminate vortex/parachute interaction information to appropriate parachute design and airdrop tactics development agencies and, (4) make vortex interaction data available to tactical mission planners.

Parachute/vortices interaction is a direct result of aircraft position. Avoiding the vortices is the bottom line in preventing interaction. If you get into a vortex, you must act quickly and decisively. Coordinated use of rudder opposite to the direction of roll, elevator to climb above the vortex, and lots of power are the answer. Ailerons are largely ineffective in recovery from wake vortices.

The best way to avoid the effects of wake vortices while flying formation is to maintain formation integrity during the airdrop—maintain proper spacing and fly the same drop altitude as your element leader. Further guidance updating specific aircraft procedures to deal with the wake vortice/drift phenomena is forthcoming.

The bottom line is: MAC pilots must understand and respect wake vortices, their effects, and how to deal with them. Planners must consider how wake vortex/wind interactions can effect formations and airdropped equipment and personnel. We must also remember that changing weather conditions can combine with wake vortices to seriously undermine mission safety and effectiveness. When flying, avoid wake vortices! However, in case of a surprise, keep in mind the proper use of rudder (opposite to roll direction), elevator, and power to counter vortices and exit them as soon as possible.

Successful airdrops require a team effort. We must back each other up to ensure we put the load where the user wants it.

(*Editor's Comments:* We gratefully acknowledge the assistance of HQ MAC/DOXT/XRTA in the preparation of this article.)

# The New IG Speaks Out

By Lt. Col. Richard L. Buck
Supervising Editor

"Obviously, the most important thing we do is to safely deliver people and cargo to their destination for the user. We are ineffective if we begin a mission and fail to execute that mission to a safe conclusion. There is absolutely nothing we do that shouldn't be done safely. It's everyone's responsibility, from the person consigning the cargo to the one boarding our passengers. Safety is everyone's responsibility."

These words, by Brig. Gen. (Sel) F. Keith Tedrow, who became the Military Airlift Command, Inspector General, on 16 April 1990, encompass his safety philosophy.

The new Inspector General has a rather unique background as far as MAC goes. "I got a fairly late start, in that I was a non-rated officer before I went to pilot training. I flew the old EC-121 and didn't come over to MAC until I was a major selectee, at which time I entered the C-5 program. Fortunately or unfortunately, the C-5 is the only MAC airplane I've flown. Consequently, my experience in the command is shaded on the strategic side and the Galaxy in particular. I've been fortunate to have flown the airplane for a considerable number of years and to have been at Dover where we had the Special Operations Low Level (SOLL) mission, upgraded the crews to SOLL II, and did the C-5 airdrop test. I've had the benefit of being associated with the special operations mission and a limited amount of airdrop. Now my business is to get as much tactical understanding as possible. I do however, know my way around the MAC system."

Colonel Tedrow expressed some very valid concerns about safety's role in MAC operations. "We live with the realization that the business we're in is potentially dangerous and everything we do is potentially unsafe. Therefore, it behooves us to operate airplanes and work around them as safely as we possibly can to remove not only the obvious, but the potential problems. What we do is so important, we don't have room for doing anything unsafe—we can't afford to take chances. We don't have room for the calculated risk. We need to do our jobs professionally with the understanding that safety is paramount."

Colonel Tedrow's view of the commander's role in the safe operation of the command's mission left little room for doubt. "Very, very critical. Obviously, each individual is ultimately responsible for the decision he or she makes and the ramifications of that deci-

sion. Along that line, commanders and supervisors must share in the responsibility. They are the ones who establish the environment; they're the ones who have the seniority and experience to help make sure people are not put in situations exceeding their capabilities. Consequently, the commander, the supervisor, and the individual, a three-edged sword if you will, must work together to prevent mishaps. The unit commander establishes the environment; the frontline supervisor knows his people and knows what they're capable of doing; and finally, the individual makes the personal decision to operate safely."

Regarding specific assets and obstacles to mishap prevention in MAC, Colonel Tedrow further emphasized the role of the individual. "The individual is the main element. We can never overlook the fact that people—those who decide to do something against the rules—the ones that decide to cut a corner—usually know in the back of their minds they're doing something wrong or know it has the potential of being wrong. They sometimes tempt fate however, and that's when something usually happens. Our biggest obstacles to safety are people who think they are above and beyond the rules—above and beyond established procedures and policies—with the 'it can't happen to me' attitude, who decide to press their luck. Safety sometimes takes a back seat along with common sense. Whether people's motivation is pride or believing it's more important to accomplish a certain phase of the mission, the safety aspect is sometimes missing. The individual is, once again, the key. The human factor, as we've seen in all of our most recent mishaps, is the obstacle. Our biggest challenge is to minimize the effect of the individual in the mishap sequence."

Colonel Tedrow had some useful advice for MAC safety folks. "Safety people in MAC have a tireless and thankless job. They're the people who have to be out there, have to be alert, have to be telling people what they sometimes don't want to hear. It's very easy for people to cut corners because they're in a hurry. There's got to be someone there, whether the safety specialist or the supervisor, who stops things, calls it to their attention, and gets things back on track. Safety folks are paramount. They are the number one entity on the commander's staff which helps keep him apprised of what they see. Commanders know what their responsibility is. They know they're ultimately responsible for what goes on in the unit, but they can't be everywhere. The safety people have to be the eyes and ears of whoever they're working for, to keep things on an even keel."

The balance between flight safety and the mission demands placed on MAC aircrews in today's environment is critical in Colonel Tedrow's view. "I won't deny that we demand an awful lot from our people, but I don't know that we've ever demanded anything other than doing the job right, doing it professionally, and doing it safely. As I alluded to earlier, the mission we have is *so* important, and the people and cargo we carry are *so* valuable, we can't afford to do it any other way than safely. General Johnson has gone out of his way to try to make it easier for people to do their job properly. By properly, I mean safely. He has given them the opportunity to make that decision on whether it's safe to move the airplane—whether it's safe to do the task. He relies on their judgment and experience to do what's proper. Our people have the tools and training, and it's simply a matter of ensuring within themselves they have weighed all the factors before they make their decisions."

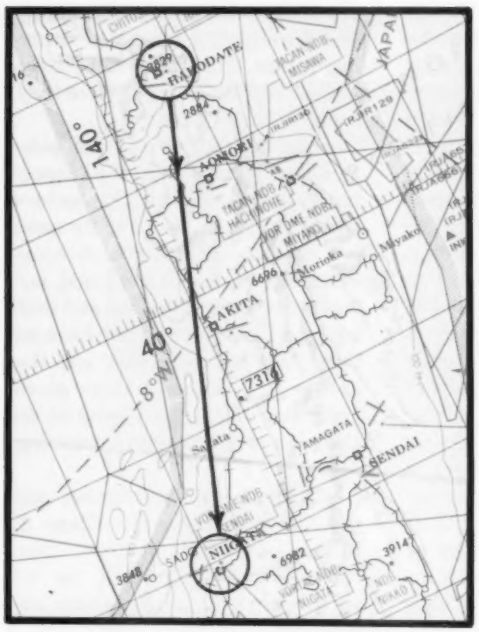
Colonel Tedrow's overall safety effort objectives as the Inspector General coincide with factors which motivate crews to fly safely. "Professional pride is obviously the biggest factor. As I said, our crews are the best trained and best equipped anywhere. They have an important job and pride, and the ability to work as a team gives them everything they need to do their job professionally—meaning safely.

"Obviously, the number one goal is to not have a Class A mishap—not to lose lives. Our specific objective must be to eliminate the human factors associated with the incidents we've had in the past. We've got new airplanes coming on line. We've got to look very carefully and closely at how the crew integrates with the environment and with equipment that's coming on board. The C-17 with its two-man cockpit crew is going to be very demanding. The crew will be operating worldwide in its potentially dangerous low-level tactical environment. We need to make sure we've done everything possible from the training and safety standpoints to make sure the crew is well integrated; that they know how to operate together as a team. We have to make sure, as our other weapon systems age and experience level of our people goes down, the people are fully prepared to operate the systems safely."

Colonel Tedrow, *TMF* thanks you for your comments.

# 303 Feet From Disaster

## Don't engage in blind trust.




GNC 5, Edition 7, used on the flight.

ONC F-10, Edition 9, showing the mountain in detail.

***(Director's Comments: For each mishap MAC has experienced (John's Knob and Zaragoza immediately come to mind), we're certain there were numerous other "almost" mishaps that were prevented by quick thinking and professional airmanship. Unfortunately, we don't often get detailed information on our "almost" mishaps for many reasons; the most probable being that the individuals involved fear negative reactions from peers and supervisors. Rest assured, we at TMF will not be critical of those who realize the mishap prevention potential of their "almost" tragedy. In fact, we seek information from these sources, and stories from those "almost" mishaps provide a vivid account of a situation that could have caused loss of lives and created a terrible tragedy for many. We at the HQ MAC Safety staff salute the members of this WRS crew and their squadron and service commanders for their proactive attitude toward mishap prevention, evidenced by their submission of the following article.)***

The weather had made our ride a little bumpy over the past three hours, but it's usually turbulent at 5,000 feet on these air sampling missions in the Sea of Japan. An inoperative autopilot required a little extra work for five hours of this 9.3-hour night flight, so the copilot decided to take a break. This was our fourth mission in four days, and even though we had flown this track many times before, we weren't bored because we had an enthusiastic third pilot along for his first trip. He came up front when the copilot checked off, and we discussed how these Far East missions differ from the Arctic polar missions we had just completed the day before. We also talked about the unique procedures for the special reconnaissance missions the navigator and aircraft commander had spent the previous month flying.

As we coasted inland, the radio altimeter lights came on as expected (indicating our altitude was 2,500 feet AGL). For reassurance, we rechecked our terrain chart which showed a low ridge on this northern peninsula of Honshu. Right on track. Suddenly, the flight engineer frantically pointed toward the flight instrument panel. His wildly frantic

motions reflected that we were going from 1,300 feet AGL to 500 feet AGL—and since we were in instrument meteorological conditions (IMC), we initiated an immediate climb. We encountered moderate turbulence and found out later it was probably from coming close to a 5,303-foot mountain—Iwakayama, surveyed at 303 feet *above* our flight altitude. We climbed out of the clouds which obscured our view of the ground and turned toward the open seas, not completely sure what had happened but badly shaken nonetheless. We later confirmed it—we just missed hitting it dead on.

How could this have happened? How could an experienced aircrew flying a routine mission in a familiar area, almost fly into a mountain? There are many important lessons to be learned from this life-threatening experience. Had any of a number of things been different, we wouldn't need to tell this story. Seldom does a single mistake lead to a major mishap (or in this case, near miss). However, at this one particular point in time, several factors (all attributable to human failings) came together to cause this incident.

Even though only 15 minutes of this 9.3-hour mission was over land, the terrain warranted a more detailed chart than we used. Despite our best efforts during mission planning to find a JNC or ONC chart as called for in our 55-series regulation, none were readily available and we chose to use a GNC-5 instead. Although our nav was somewhat uncomfortable with only a GNC chart, our 55-series reg wasn't that specific. Lulled by the luxury of having onboard navigators, our squadron's pilot training program did not adequately emphasize differences among various terrain charts. To further compound the problem, Iwakayama was not labeled on the GNC-5. This particular mountain was on three other GNC charts covering the same area, but some map maker failed to put it on the chart used. Since then we've ensured the peak will be noted in the CHUM and future editions of the chart. We did follow AFR 60-16 rules for terrain separation by planning to keep the required minimum 2,000 feet above a 44 nm corridor, but that was based on our selection of an inappropriate chart. A GNC is not really a terrain chart. The Defense Mapping Agency Aerospace Center defines its purpose for ". . . extended long-range, high-speed, high-altitude aerospace navigation with secondary considerations given to mission planning . . ." The lessons here: formal training programs don't always make you aware of all hazards and not thoroughly understanding regulations can make you look stupid; you must recognize and overcome these handicaps to ensure safe flying and decision-making; and if you are uncomfortable or you note a deficiency, you are obligated to surface the problem so corrective action can be taken. Furthermore, *charts can be wrong, but you have to use the right chart for the right mission* to begin with.

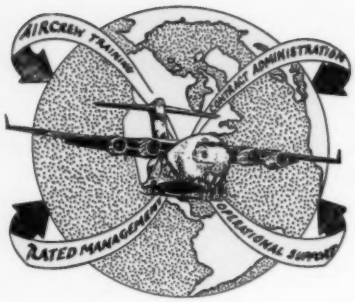
Fatigue affected our performance. These four missions transited 14 time zones, ranged from five to 12 hours in duration, and were performed with minimum ground times—legal but short. The aircraft commander had only the minimum required crew rest following a month-long deployment, and the navigator had waived his post mission crew rest in order to accomplish this mission. Flying with an inoperative autopilot tired us out even more. The lesson—if *you think you may be fatigued, you probably are and performance will suffer.*

On top of all of this, we were complacent. Our mission coordinator (not a qualified crewmember) had planned our air track at this and other altitudes many times before. He gave us a recommended flight route printed up from his personal computer upon our arrival at base operations. Computer flight plans are normally so accurate they too, can become a death trap if accepted blindly. The lesson learned? Even though flyers must trust mission planners, don't engage in blind trust. Strive to learn more about the tasks others perform to support your flying operations (to back them up). Complacency can kill.

Once airborne and as we entered the "over land" phase of flight, we didn't pay attention to the radar ground map. This was our navigator's first operational mission in this area of the world, and he used the over land portion of flight to update our inertial navigation systems (INS) with the first navigational aids available after a long over water portion of the flight, while simultaneously using the radar to avoid weather hazards. The lesson? Inform the other crewmembers as soon as you suspect you are becoming task saturated, so they can back you up.

Flying is inherently dangerous but especially when flying night low-level missions in IMC. The lesson? There is a point where danger becomes unacceptable and a peacetime mission must be abandoned. Needless to say, squadron policies have been clarified to lessen mishap potential and minimize danger.

Being human, aircrews are susceptible to making mistakes, just like anyone else. However, ours weren't the only lessons learned that fateful night. By our telling this story, first to our squadron commander and now to you, it is our fervent hope you too can learn from this incident. We are already flying smarter—a wiser, more experienced, more diligent crew.




# Changes in Aircrew Training

## Results of the Little Rock Training Review

By Maj. Stephen E. Behr
Associate Editor

*(Editor's Comments: Special thanks to Col. Terrence J. Brady, Director, Aircrew Training, Deputy Chief of Staff, Operations, and his staff, for their assistance in preparing this article.)*

It is no understatement that 1989 saw revolutionary changes in MAC aircrew training. These changes touched each of our 15,000-plus MAC and MAC-gained crewmembers operating 23 different aircraft in almost 100 locations worldwide. It is appropriate to explain to you, the aircrew member, the seemingly endless variations on the theme, "What does my AFORMS product say I need to do today to become a MAC combat crewmember?"

**Training Principles**

It is HQ MAC's job to ensure MAC and MAC-gained Air Reserve Component aircrews are trained to meet war and peacetime taskings by National Command Authorities. This is done by creating a training continuum from basic training (UPT, UNT, FE/LM Basic School) through initial qualification in your weapon system, to continuation training at your home unit as a mission-qualified crewmember. Along the way, upgrade points are set based on time in the aircraft and total time for transition to the next higher qualification. This continuum must fit all participants, from basic loadmaster to stan/eval pilot and wing commander. Headquarters MAC/DOT formulates policy and guidance in the MAC 51-series regulations and creates an infrastructure to provide the training. This infrastructure begins with the formal schools: Altus, Little Rock, Kirtland, Hurlburt, and Scott, and extends to your operational units with both military and civilian instructors who provide hands-on training along the way. This training infrastructure, along with a large dose of training opportunities (flying hours), is designed to create a crew force ready at a moment's notice to successfully perform the assigned mission.

To achieve this combat ready crewforce we adhere to ten principles of aircrew training:

(1) Every MAC crewmember may be subject to hostile fire. Therefore, they must be trained for that contingency. The training program must never lose track of that responsibility.

(2) Develop training programs using Instructional Systems Development (ISD) principles to determine the tasks, conditions, and standards of performance for each crew position in each weapon system.

(3) Tailor training programs to the level of the person receiving instruction.

(4) Standardize initial qualification through a robust curriculum at formal schools. Conduct upgrades and requals at these schools to assure continuity and efficiency.

(5) Validate the effectiveness of the training program through MAC-administered evaluations and training feedback tools.

(6) Ensure that cognitive and physical skills are repeated regularly to reinforce and maintain competency. This is accomplished by requiring crewmembers to fly certain minimum events within certain periods.

(7) Ground training is an integral portion of the training program. Scrub every event and ensure only valid, necessary items are taught.

(8) The Aircrew Training System (ATS) contract is the training foundation for many weapon systems, and as such, our civilian contractors are key partners in the combat training team.

(9) Only the best crewmembers should become instructors and only the best instructors should be chosen for assignment to the formal schools.

(10) The leader on scene is more aware of the situation than the staff 1,000 miles away, and the local leader's view will prevail if it does not violate established policy.

**PANEL MEMBERS**

**Flying Training Panel**
Col. Cotter—437 MAW/DO (Chairman)
Col. McCartney—ANGSC/AD
Lt. Col. Holmes—61 TAS/DO
Lt. Col. Stevens—37 TAS/CC
Lt. Col. Jackson—AFRES/DOT
Lt. Col. Rehkop—41 ARS/CC
Lt. Col. Gastrok—176 COMPG/DO
Lt. Col. Sisk—172 MAG/DO
Lt. Col. Matarese—76 MAS
Lt. Col. Keith—8 MAS/DO
Lt. Col. Mitchel—4 AF/DOO
Lt. Col. Davis—75 MAS/ADO
Lt. Col. Lonnelman—3 MAS/DO
Maj. Dooley—105 MAG/DOT

**Ground Training Panel**
Col. Harden—22 AF/DOT (Chairman)
Col. Kennish—143 TAG/DO
Col. Bankers—910 TAG/CC
Lt. Col. Turney—50 TAS/DO
Lt. Col. Blake—40 TAS/CC
Lt. Col. Elliot—ARS/DOT
Lt. Col. Smith—144 TAS/DO
Lt. Col. O'Donnel—438 MAW/DOT
Lt. Col. Kobold—14 MAS/DO
Lt. Col. Lockler—34 TATG/DO
Maj. Stokes—AFRES/DOT
Maj. Irwin—22 MAS
Maj. Gutskie—314 TAW/DOT
Maj. McCormick—ANGSC/DOO

Fig. 1. Little Rock Training Review Panels

**Command Training Review**

With these principles in mind, let's review some of the changes that took place last year. In October 1989 the Little Rock Training Review reaffirmed the combat orientation of ground and flight training programs and supported the ATSs as they grow and mature.

The broad experience base represented at the Little Rock conference was instrumental in a meaningful exchange of ideas about virtually all aspects of our current training programs. The conferees were divided into two primary working panels; the first, chaired by Col. Steve Cotter (437 MAW/DO), focused on flight training, while the second, chaired by Col. Mick Hardin (22 AF/DOT), reviewed ground training. Panel members are listed in Fig. 1. For two-and-one-half days, these panels discussed every facet of training with three priorities in mind:

1. Is the training really necessary?
2. If so, can we do it better (availability, flexibility, etc.)?
3. If it isn't necessary or needs reducing, let's get it done.

In answering these three priorities, emphasis was placed upon issues such as: Does the training requirement support a wartime mission? Do we really need this or is it simply a square-filler? Can we make it better by new media, new methods, or integrating it into other programs?

The flight panel came to two basic conclusions. The first, that overall flight training requirements should not be reduced by any significant amount; if anything, further training time for effective tactical capability is needed in strategic airlift. The second identified a need to add flexibility in allocating training resources and documenting the results. Therefore, the panel recommended we revise training tables and AFORMS accounting to significantly reduce the number of tracked events. The charts at Fig. 2 give an idea of the number of old versus new training events. The other major recommendation was to institute a Unit Managed Continuation Training Program (UMCT). This process gives the squadron commander the authority and responsibility to tailor his training resources to the needs of his unit. To implement this, the commander may categorize his crewmembers into one of three categories directing them to do 75, 100, or 125 percent of the training table requirements. This categorization will normally be done through a squadron board composed of training and stan eval members who recommend placement of individuals in a category based upon their checkride performance, training records, and board members' personal knowledge of the individual. The commander's decision on a crewmember's currency category is then in force for the next semi-annual currency period. This board will again assess, at each semi-annual period, all crewmembers and continue or revise an individual's currency category.

Some changes in flight currency removed items tracking each kind of nonprecision or precision approach, added flexibility in airdrop events, and liberalized the

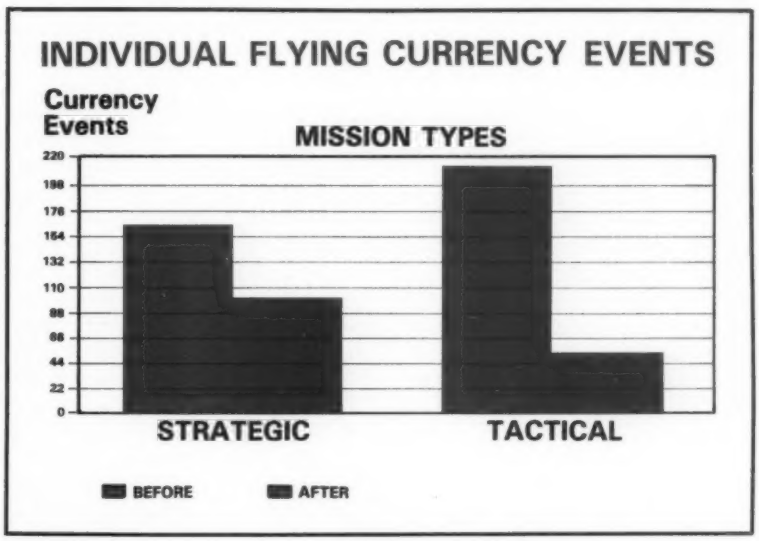



Fig 2.

**Combined Events:**

| Event | Includes |
|---|---|
| TVT (CAT) | Intel, Authentication, Electronic Warfare, Isoprep, Initial CAT |
| Simulator Refresher | ACT/MOST, Chem Warfare Task Qual Training |
| Ground Chem Warfare | Aircrew Chem Defense, Chem Warfare, Explosive Ordinance Recognition |
| Combat Survival Tng | Self Aid, Buddy Care, Survival Training, Code of Conduct |

**Items Transferred to Formal School:**
Aeromedical Rigging, Combat Offload, Command Indoctrination (Aircrew and Pilot/Nav), Ground Egress, Pilot Weather Avoidance, Initial Anti-Hijacking

**Events with Adjusted Frequency:**

| Item | Old | New |
|---|---|---|
| MAC Flight Line Security | Annual | One Time |
| Human Intel Threat | Annual | PCS In |
| Protection from Terrorism | Annual | PCS In |
| COMSEC | Annual | PCS In |

Fig. 3. Examples of changes to ground and ancillary training items.

Tactical VFR Training (TVT) rules. C-130 changes included a system of currency based upon "profiles" instead of separate events. For example, a visual airdrop "profile" includes the separate events of formation departure, low-level route, TOT control, airdrop, and recovery, into one visual airdrop profile. Assault landings were reduced from 18 to 12 annually, the only substantial reduction. In addition, C-130 confidence maneuvers were moved from the aircraft to the simulator for those units with access to a simulator.

The ground training panel had many spirited discussions and decided on two basic findings. The panel confirmed that simulator programs are important contributors to readiness, crew proficiency, and safety. MAC should look for more opportunities to use these resources. The second finding recommended redesign of some training events into logical blocks, i.e., combine aircrew chemical defense with ground chemical defense; and intel/authentication, electronic warfare, and others with low-level training. The listing at Fig. 3 shows some of the recommendations that are now in use. Still unresolved are items requiring coordination and concurrence with agencies outside MAC.

To date, more than 40 percent of the requirements recommended for change were deleted, combined with other events, or changed to reflect decreased frequency of training. Less than 10 percent met with refusal to change by the agency mandating the training. More than half of the ancillary training events will be significantly reduced for MAC aircrews.

Additionally, formal schools will conduct approximately 15 percent of the ground training events formerly done in-unit. Finally, at the panel's recommendation, 20 percent of training events remained unchanged because it made good sense to leave them as is. Changes will continue in the foreseeable future as we implement General Johnson's direction to enact the Little Rock recommendations.

**Tactical VFR Training**

Strategic airlift's tactical training was formerly called CAT. To avoid confusion and simplify the training issues, a new name was in order. TVT was the term the field suggested; HQ MAC/DOTS agreed. (The C-130 force continues to use the term CAT for portions of their mission.)

Several other events impacting TVT occurred about the same time as the Little Rock training conference: MAC discovered the C-141 airframe was incurring a more rapid stress deterioration rate than originally planned, and budgetary constraints reduced C-141 and C-5 continuation flying hours. These and other events, along with the training conference, resulted in restructuring the TVT program.

Changes to the C-5/C-141 airlift TVT program, which were institued by HQ MAC/DO messages in December 1989, are as follows:

- The name CAT was changed to TVT.
- The low-level day altitude was changed from 500 feet modified contour to 1,000 feet segmented, same as night altitudes (segmented is 1,000 feet above the prevailing obstacle within five nautical miles of course centerline for a given segment).
- Reduced TVT currency requirements from three per semiannual period/one per quarter for low-level routes, threat avoidance arrivals and departures, and accuracy landings (one of each must be night) to one per quarter (one low-level route per semiannual period must be night).
- TVT check-out program changed to instructor pilot certification and eliminated the flight examiner-administered evaluation.
- Established certification program structure to include a mini-

mum of three flights, one during the day and two at night.

- Deleted mandatory requirement for TVT events on annual composite evals and operational mission evals.

- Affirmed that crew members may still be evaluated on TVT maneuvers on flight evaluations.

- Stated that noncurrency in low level sorties, threat avoidance departures and arrivals, and accuracy landings are not a grounding item for the crew member's airland mission.

HQ MAC/DO, subsequent to the December message, coordinated with MAC Logistics folks and agreed that establishing the training altitude for day low-level routes to 1,000 feet modified contour will have minimal impact on the service life of the C-141 airframe. Night low-level routes remain 1,000-foot segmented altitudes. After depot-level replacement of wing fasteners is completed, you can anticipate returning to 500 foot modified contour. Modification of the C-141 fleet is expected to be complete in fiscal year 1992.

In OSA, the C-12 and C-21 airframe assessment is being coordinated through the logistics center with the prime aircraft contractors. Impact of TVT should be minimal and MAC will continue with the full TVT program.

**ATS Update**

MAC continues to proceed with full implementation of contracted ATSs. By using contractors, we reduce MAC training costs and rated formal school staff requirements. About 60 percent fewer formal school assignments are necessary than a few years ago. Also realized is a hidden resource—retired instructors who can continue passing on their experience to the next generation of airlifters.

The C-5 ATS is fully implemented, and work is progressing with the Reserve and Guard to add another weapon system trainer at Westover AFB that will include a full daylight visual system.

C-130 ATS is nearing completion of the development phase. All formal school courseware and ground instructors are now contracted. All simulator maintenance, logistic support, and simulator instructors are also provided by contractors. Additionally, contractors provide most of the continuation training courseware and instructors. Later this year AFRES and 23 AF C-130 units will receive computer-based training stations in their units. This will tie all C-130 units into the same continuation training courseware.

The C-141 ATS is in its initial stage. Hughes Training Systems took responsibility for teaching existing ground-based courses for both formal school and continuation training. They are currently working to update the simulators and add full motion bases. A C-141 flight test involving over 100 flight hours gathered all the aerodynamic data necessary to finally bring the simulator flight characteristics in line with those of the aircraft.

The special operations world will soon begin a similar process for training. Three leading contractors are competing for a SOF ATS contract award this August.

We experienced many growing pains as MAC moved into the arena of contracting aircrew training systems. It forced us to change the way we do business. Each passing day reveals greater benefits of the program. One real plus is a large number of the contractor's personnel who are retired blue-suiters and want to see the system work to our benefit as much as we do.

Each of us has a role in this process if we are to receive the finest possible training. One big tool is the course critique. It is extremely important that you carefully critique the training you receive. If you don't take the time to give a professional input, you bear the responsibility for not contributing to quality. Without feedback, the system will continue along the same line with little or no improvements. A little bit of your time can bring significant benefits to your program.

Each base has a designated officer responsible for contract training in the wing DOT shop and a separate quality assurance position also exists which forwards inputs to MAC's training program manager. Those program managers are:

C-5—Maj. Terry Mast; Maj. Al Wathen (Av 576-3610)

C-141—Maj. Keith Chauret; Maj. Dave Stahre (Av 576-3610)

C-130—Maj. Walt Tomczak (Av 576-3625)

SOF—Maj. Mike Stanley (Av 576-3625)

Helicopters—Lt. Col. Fred Madsen (Av 576-3625)

Crewmembers, training managers, and contractors must work together to make sure our training is thoroughly complete and current. Only through the efforts of these people, plus each of YOU, will training keep pace with the changing environment in which we live.

Do your part—take the time for thoughtful constructive critiques and suggest improvements through your unit's training managers.

The folks at MAC Training recognize that changes to training requirements are frequent and as inevitable as o-dark-early alerts. Their goal is to respond with timely revisions to provide you the tools you need to meet the challenging new missions of tomorrow.

# C.R. TERROR

**The Ambient Aviator meets Doctor Strangeglove.**

With a sigh of relief C.R. asked, "Can I get dressed now?"

"Sure can, that about does it," replied the flight surgeon as he stripped off his rubber glove and

nonchalantly dropped it into the red trash container marked "toxic bio-hazardous waste only."

C.R. had nearly reached the end of his annual encounter of the most unpleasant kind, and after two days of being punched, bled, burped, bottled, and most recently probed, his reluctant remains were eager to be on their way.

"Well Doc, am I gonna live?" asked the Magic Major as he finished zipping his custom-tailored nomex flight suit and settled into the empty chair next to the flight surgeon's desk.

The flight doc, Doctor Strangeglove, who had just finished inscribing a new series of medical hieroglyphics into the "War and Peace" sized folder holding the once Portly Pilot's medical history, looked up and, with a rather ominous tone replied, "Let's see."

C.R. winced and thought "here comes trouble." Once more, a flight surgeon, who looked no older than the youngsters who hand-dried the "Terrormobile" at the local car wash, was going to point out the hazards in his lifestyle. This particular 1990's version of young Dr. Killdare distinctly reminded C.R. of an ankle biter he noticed years ago in the peanut gallery of the "Howdy Doody" show. That youngster had brought attention to himself by loudly announcing on national television, five minutes too late, that he badly needed a bathroom.

"Some aspects of your physical condition have improved since your last exam. Your weight, while not ideal, is within standards; and I see from your history it has been a problem in the past."

"Let me put your mind at ease Doc," replied the Master Manipulator. "You are looking at a reformed man and honor graduate of the Tassels Taylor Health Farm. The positive habits I picked up during my stay there are still with me. I no longer rely on just bag dragging and high-energy crew rest to keep this old bod in shape. In fact, in some circles I am known as the Sultan of Strain and my feats of athletic prowess on the base jogging trail are becoming legendary. You can rely on me

'aerobicizing' my now crystal clear lungs at least three times a week for a minimum of 30 minutes per effort." Reaching deep into his flight suit pocket, C.R. retrieved his still unopened pack of gold-ringed Egyptian Oval cigarettes and proudly displayed the intact seal. "I've been carrying this pack around for over a year now and so far I'm still winning the battle."

Just as the Silver-Tongued Fox was about to go into detail on his war against the forces of the evil weed, he was interrupted by a soft knock on the door. After an acknowledgement by the flight doc, 2d Lt. Goodbody, the clinic's newest, youngest, and considered by many the prettiest nurse, opened the door. With an "Angel of Mercy" voice befitting her petite frame, Lieutenant Goodbody apologized for interrupting, and announced she had the results of Major Terror's blood tests. She was sure the doctor would want them. C.R., grinning gourmet of girlhood that he is, spoke before the flight surgeon had a chance to reply. He not only thanked the lieutenant for her thoughtfulness, but attempted to arrange an appointment for later in the day, when perhaps she could counsel him on the important papers she had just handed over. With a smile, she assured the Able Aeronaut that the doctor could present a much better interpretation of the results. Before C.R. could counter, Lieutenant Goodbody slipped back out the door.

With the lieutenant gone, the once again Frustrated Follower of Femininity turned his limited attention span back to the flight surgeon and waited for the dispenser of medical wisdom to speak.

"Well Major, I certainly do congratulate you on your efforts but I see something in your test results we should talk about. Your cholesterol reading is very close to the 250 mark, with an unfavorable distribution of cholesterol type. The maximum reading we would like to see is no more than 200. I'm afraid, unless we do something to lower your count, you may well develop heart problems far more serious than any damage Lieutenant Goodbody may have just done."

"Doc, I've been suffering my way through these annual ordeals for more years than I care to count, and I'm convinced the medical community connives to periodically come up with restrictions to complicate my life. Just what is cholesterol, and what effect can it have on the C.R. Terror Temple of Masculinity."

"Major, I'm glad you asked. Cholesterol is a natural substance essential to life. In fact, your own liver produces the majority of what you need; only 40 percent of your total count comes from food. Cholesterol is a waxy, fat-like substance that can, when allowed to get out-of-hand, result in a buildup in the arteries, just like mineral deposits in a garden hose. This buildup can cut down the volume of blood that reaches the heart—less blood equals less oxygen. If the buildup gets to the point that the blood flow is cut off all together, the result is a heart attack.

"The medical term for this condition is atherosclerosis, and your cholesterol intake is just one of a series of causes. Other considerations are your family history, smoking, obesity, amount of exercise you get, age, and your total calorie intake; especially your calorie intake from saturated fat.

"It's important to remember that you need to avoid not only cholesterol, but also saturated fat. Any fat that is solid at room temperature is saturated. Fat consumption is associated with obesity, some types of cancer (in men it would be prostrate and colon cancer), and gall bladder disease."

"Gadzooks, m'boy! Time to remember your audience. Yours truly may be the World's Greatest Aviator but I don't know a cholesterol from a cauliflower, much less the relative merits of a bagel vs. a banana."

"Yes Sir, most people have trouble turning their desire for a reduced-cholesterol, reduced-fat diet into an actual shopping list. You need to focus on foods like vegetables, fruits, cereal grain products, fish, poultry, lean meats, and low-fat dairy products.

"Your goal should be to limit your daily cholesterol intake to no more than 300 milligrams. Some foods are exceptionally high in cholesterol and you really have to watch how much of them you eat. For example, three ounces of dry pack shrimp have 147 milligrams; one cup of chili normally has 133, one hard-boiled egg has 218, and fried or scrambled eggs have even more. At the top of the list we have things like fried beef liver, three ounces equals a whopping 372 milligrams; more than you should have in an entire day.

"It's also important to remember that your goal is to avoid not only cholesterol but also saturated fat. Even if a product has absolutely no cholesterol, you still need to find out how much saturated fat it contains. Did you know that five slices of pizza have less total fat that one doughnut? Expensive ice cream is a real leader in the total fat parade with over 23 grams per cup.

"How you prepare your meals can also make a big difference. You should broil, bake, or roast meat, fish, and poultry, and avoid frying. What you want to do is allow the fat to drip away from the food as it cooks. A fried chicken sandwich can have more fat in it than a plain hamburger.

"Major, I know I've given you more information than I can expect you to remember. We've got some literature you can take with you. It explains this in more detail and it even gives you a suggested diet. Just remember, most people can successfully lower their cholesterol level by making changes in their diet and there's no reason to think you can't do the same.

"I really want to encourage you to keep up your exercise program and maybe even expand it. People who exercise regularly have, overall, a lower death rate from all causes than those who don't. Exercise will help reduce stress, increase your stamina, and will definitely help keep your weight down. Some of my older customers who exercise regularly have physicals that indicate their bodies are 20 years younger than their actual age!"

"Okay Doc, you've sold me. Nothing would make me happier than to hold back Father Time and keep this national landmark available for the next generation of beauties. The women of the world are indebted to you."

"Well Sir, I certainly hope they see it that way. By the way, did you know that married men generally live longer than single men? People with partners are on the whole healthier and happier and recover from illness quicker than those who are alone."

"M'boy, I appreciate what you're saying and I see why single men erode more quickly than the married variety—certain demands on our endurance are bound to tell over time." With those parting words, the Ace of Aerospace stood up and, with a handful of pamphlets in his slightly pudgy paw, made his way into the hall.

As our hero passed the lab, he recognized the voice of his ever-reliable navigator, Blinky Donivan, who apparently was in some sort of distress. C.R. poked his head into the room and found his faithful follower seated in the oversized grade school desk normally reserved for victims of periodic blood-letting. A rather flustered Lieutenant Goodbody was standing over him with an obviously empty blood vial in her hand. As the Able Aeronaut entered to offer whatever help he could, he heard her say, "I don't understand it, I've done this a million times on oranges and grapefruits, and it always worked perfectly."

# Flying-Hour Milestones

## 10,000

**7 MAS**
SMSgt. Michael L. Wright

**68 MAS**
MSgt. Raul Cavazos

**437 MAW**
SMSgt. Frank H. Sellers

## 5,000

**57 MAS**
Maj. David A. Davis
MSgt. Maurice D. McGinnis
MSgt. John L. Murphy
TSgt. John C. Matthews, Jr.
TSgt. Neil T. Tousignant
SSgt. Wayne A. Werling
Sgt. Courtney H. Franklin

**62 TAS**
TSgt. Johnathan L. Snider

**67 SOS**
MSgt. Ronald D. Hennion
MSgt. Richard W. Todd

**176 COMPG**
Col. Jerry P. Jones
Maj. Lance G. Carey
Maj. Michael C. Post
Maj. Keven C. Windel
SMSgt. Kenneth W. Jackson

**730 MAS**
TSgt. Lonnie R. Kimmball

## 2,500

**HQ MAC/IGI**
Lt. Col. Kenneth R. Pribyla
Lt. Col. Carl T. Duerson
Maj. Richard G. Ruth
Maj. Bruce S. Mahaffey
Maj. Rodney C. Pressley

**3 MAS**
Maj. Joseph P. Alfano
Capt. Kenneth N. Blackburn
Capt. Robert S. Langman
Capt. Phillip A. Meade
Capt. Robert P. McVey
TSgt. Phillip Zabolotny
SSgt. Lee V. Mack

**9 MAS**
Maj. Robert J. Myers
Capt. Alan K. Baker

**20 MAS**
Capt. Al C. Smith
TSgt. George D. Faris

**21 TAS**
Lt. Col. George S. Sullenger
Maj. Samuel J. Melvin
Capt. Donald R. Brinson
Capt. Kevin S. McDonough
SSgt. Edward B. Eubanks
SSgt. Jeffrey M. Scott
SSgt. Anthony G. Thompson

**57 MAS**
Capt. Carlee A. Bishop
Capt. John S. Crow
Capt. Todd F. Eberts
Capt. Keith R. Turner
Capt. James R. Pavlisin
Capt. David E. Vincent
TSgt. John D. Williams

**62 TAS**
Capt. Mark J. Barnabo
Capt. Kevin C. Krisinger
Capt. William J. Paliwoda

**76 MAS**
Maj. John E. Puffenbarger

**67 SOS**
Lt. Col. Donald B. Bortner
Maj. Carl George
MSgt. Gary W. Teipel
SSgt. Karl A. C. Debaca
Sgt. Nick Banda

**176 COMPG**
MSgt. Terence V. Pallas
TSgt. Benjamin J. Grunwald
TSgt. Gary K. Lanham

**183 MAS**
Maj. Charles D. Brooks
Maj. Robert A. Cain
Maj. William B. Jernigan

**345 TAS**
Maj. Kenneth C. Lambert
Capt. Dwight E. Davidson
Capt. Jon D. Norcross
Capt. Bradley R. Pray
Capt. Barry N. Simmons
Capt. Frank R. Worrall
Capt. Frederick A. Wisor, Jr.
TSgt. William F. Fraley
TSgt. Robert L. Garcia
TSgt. George R. White
SSgt. Mark H. Franke
SSgt. Charles P. Shelton, Jr.
Sgt. Kenneth L. Byro

**907 TAG**
MSgt. Mark D. Darby
TSgt. Anthony L. Eberhardt

**1403 MAS**
Maj. Ronnie D. Lanier

## 1,000

**37 ARS**
1st Lt. James F. O'Connell
1st Lt. Robert J. Richmond

**56 ARS**
Sgt. George P. Levkulich

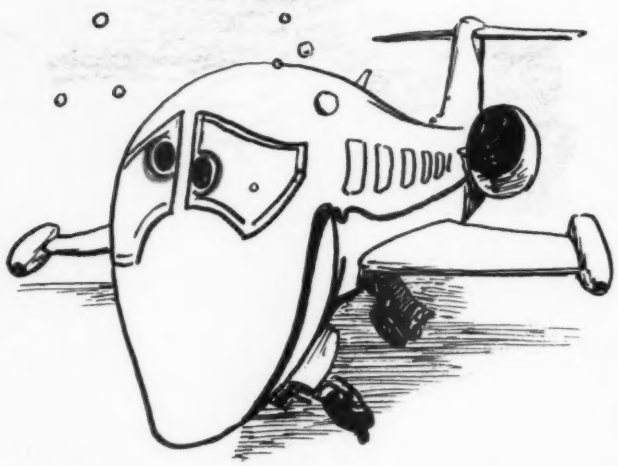
Ranks and units are those at time of award.

# QUICKSTOPPERS

## And Another One Bites the Dust— Fire Bottle That Is!

Just when you thought it was safe to taxi . . . . During block-out, a Starlifter scanner signaled transient alert to remove a fire bottle from in front of the aircraft. Thinking the fire bottle was out of the way, the scanner cleared the pilot to taxi. As the aircraft started to move forward, a nose gear door tried to move the fire bottle. The pilot stopped the aircraft to allow the scanner to inspect the results. Noting only minor damage to the fire bottle and just a small dent in the gear door, the mission continued. By the way, what is the proper signal for removing a fire bottle? We've been checking our copy of AFR 60-11 and AIM to no avail.

## Was it Hypoxia or Hyperventilation?



During cruise at FL390, a C-21 copilot noted the oxygen pressure gauge reading zero psi; a fact confirmed by the AC. The copilot announced he was experiencing hypoxia symptoms. Not to be "out-symptomed" by a copilot, the AC said he also felt the onset of hypoxia—*at a cabin altitude of 5,600 feet.* Our intrepid aircraft commander directed the copilot to "declare an emergency" and begin an emergency descent to 14,000 feet. The crew accomplished the first four items of the critical action checklist. About this time, the crew noted that oxygen wasn't flowing to their masks. After leveling the Learjet at 14,000 feet (most likely with a cabin altitude of around 5,300 feet) the crew began feeling better. After landing, a quick inspection by the flight surgeon determined the crew experienced hyperventilation—not hypoxia. Maintenance diagnosed the oxygen bottle as leaking when cold-soaked at high altitudes.

# THREE BLIND MICE

The reported weather at the time of the night approach was: indefinite ceiling, 300 feet obscured, one mile visibility in fog, and a runway visual range of 3,500 feet. As the Boeing 727 crossed over the end of the high-intensity approach lights, the Captain flying the approach found he could only see three or four lights on the left side of the runway and these he could not see clearly. He did not mention this to the other crewmembers and continued the approach. As he was making the landing flare, the First Officer informed the Captain the aircraft was veering off the runway. A go-around was initiated, but the aircraft touched down heavily before climbing away. The Captain flew a second approach; the approach lights were sighted 100 feet above decision height and, once more, the Captain had difficulty acquiring the runway environment. He still didn't comment on the trouble he was experiencing, and as he was about to flare, the First Officer felt the landing would be unsafe and offered to take over. The First Officer then realigned the aircraft with the runway and completed the landing. The Captain taxied the aircraft to parking, and after shutdown, the crew was informed of right wingtip damage. The Safety Board found the Captain was wearing half-eye reading glasses and their improper use may have contributed to his vision difficulties. The Captain didn't inform the crew of his problem, nor was there any discussion among the flight crew prior to the second attempt on why the first landing attempt was unsuccessful. Do the words "crew coordination and cockpit resource management" ring a bell?

Adapted from *Flight Safety Digest.*

# THE CASE OF THE MISSING SCREW

As the C-130 departed for home station and raised the gear handle, the right main landing gear remained in transit. The crew climbed to 10,000 feet, entered holding, and checked circuit breakers, utility hydraulic pressure, and fluid level—all were normal. After contacting the destination command post to initiate a conference skyhook and declaring an IFE, the crew unsuccessfully attempted to override the main gear selector valve IAW Dash One procedures. They then tried to manually extend the gear, again unsuccessfully. After normal and emergency procedures failed, the crew proceeded with alternate landing gear extension procedures. They separated the companion flanges and the aft strut free fell 3 to 5 inches before stopping. The crew attempted to extend the forward gear with the manual extension system, then used the emergency extension wrench on the aft gear. After the wrench broke and was removed, the gear free-fell to the down and locked position. Upon arrival, the crew landed, stopped on the runway, and was towed to parking.

Investigation revealed the culprit to be a "missing screw." The problem resulted from the loss of the screw holding the friction washer retaining nut in place. With the retaining screw missing, the retaining nut was free to move. In this case it tightened up against the friction washer, preventing the ball screw from moving.

Once again a nut missing a screw endangered life and limb.

# After Deadlines

**AIRCREW FLIES MILESTONE MISSION** -- Eleven MAC C-5 crewmembers secured their place in history on 11 April 1990 by transporting the first Ground Launched Cruise Missiles off West German soil. This event marked an important milestone in the removal of nuclear weapons from Europe in accordance with the Intermediate Nuclear Forces Treaty between the United States and Soviet Union. A 10-person 22 MAS crew and 60 OMS crew chief, all from Travis AFB, Calif., retrieved the missiles at Hahn AB, West Germany. The missiles, located at Wueschheim AS, West Germany since December 1985, were trucked to Hahn AB for the pick-up. The missiles will be destroyed at Davis-Monthan AFB, Ariz., under treaty terms. The INF treaty permanently bans all U.S. and Soviet GLCMs with a range of 500-5,500 kilometers (300-3,400 miles).

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**AERIAL WORKHORSE CELEBRATES SILVER ANNIVERSARY** -- Ceremonies at Travis AFB, Calif., marked the 25th anniversary of the Lockheed C-141 as an operational aircraft. The first of the four-engine jet military transports was delivered to Travis AFB on 23 April 1965. Lockheed delivered the 284th and final C-141A in February, 1968. Since then, C-141s have accumulated more than eight and a half million flight hours and landed on every continent on the globe, including Antarctica. The Starlifter has become the multi-purpose workhorse for MAC. It's used for cargo, passengers, paratroops, heavy equipment airdrops, and aeromedical evacuation. Known around the world for its humanitarian missions, the aerial workhorse has airlifted relief supplies to areas stricken by earthquakes, floods, hurricanes, and other natural disasters. In one of its most memorable missions as the "A" model, C-141s flew home 566 military and 25 civilian POWs from North Vietnam in 1973. The airlifter also played decisive roles in military operations in Beirut, Grenada, and Panama. The Starlifter goes down in space history as the airplane NASA enlisted to transport the Apollo 11 crew and its quarantine capsule, following the first moon walk in 1969.

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**GOOD BYE QFE** -- Begining 2 July 1990, all military airfields in the UK will begin using QNH as the standard altimeter setting. QFE will still be available for those who specifically ask for it.

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# WINNERS
# 1989 USAF SAFETY PLAQUES

## Flight Safety Plaques

**9th Special Operations Squadron**
**53d Weather Reconnaissance Squadron**
**62d Military Airlift Wing**
**136th Tactical Airlift Wing (ANG)**
**146th Tactical Airlift Wing (ANG)**
**153d Tactical Airlift Group (ANG)**
**165th Tactical Airlift Group (ANG)**
**317th Tactical Airlift Wing**
**374th Tactical Airlift Wing**
**375th Military Airlift Wing**
**435th Tactical Airlift Wing**
**437th Military Airlift Wing**
**438th Military Airlift Wing**
**443d Military Airlift Wing**
**907th Tactical Airlift Group (AFRES)**
**1550th Combat Crew Training Wing**

## Explosives Safety Plaques

**608th Aerial Port Squadron**
**919th Special Operations Group (AFRES)**

## Nuclear Surety Plaques

**4th Military Airlift Squadron**
**438th Military Airlift Wing**